Received: 18.11.2010 / **Accepted:** 08.02.2011

DOI: 10.5137/1019-5149.JTN.3922-10.0

Computed Tomography Findings in Cerebral Hydatid Disease

Serebral Hidatik Hastalığında Bilgisayarlı Tomografi Bulguları

Nisar A WANI[1], Tasleem L KOUSAR[1], Tariq GOJWARI[1], Irfan ROBBANI[1], Manjeet SINGH[1], Altaf RAMZAN[2], Qayum KHAN[2], Altaf KIRMANI[2], Afzal WANI[2]

[1]Sher-I-Kashmir Institute of Medical Sciences (SKIMS), Department of Radiology, Srinagar, J&K, India
[2]Sher-I-Kashmir Institute of Medical Sciences (SKIMS), Department of Neurosurgery, Srinagar, J&K, India

Correspondence address: Nisar A WANI / E-mail: nisar.wani@yahoo.com

ABSTRACT

AIM: To describe imaging findings of cerebral hydatid cysts on computed tomography of brain.

MATERIAL and METHODS: We retrospectively reviewed CT scans of brain in 5 patients with pathologically confirmed hydatid cysts in cerebral hemispheres. The patients were scanned either on a spiral (single slice) CT or on multidetector-row CT before and after intravenous injection of iodinated contrast material.

RESULTS: All the patients were children aged 8 to 13 years with 3 boys and 2 girls. Features of raised intracranial tension were present in all the cases at presentation. CT findings of a large intracerebral cystic lesion with significant mass effect and without any calcification or enhancement were common in all 5 cases. Perilesional edema was present in 1 case. Cerebral hydatid was seen as either a homogenous fluid attenuation unilocular cyst (3 cases) or a unilocular cyst with few peripheral daughter cysts (1 case) or cyst filled by multiple daughter cysts inside (1 case). All the cases were operated and cyst was removed completely after craniotomy.

CONCLUSION: Accurate preoperative diagnosis of cerebral hydatid by CT followed by surgery with care to avoid cyst rupture can result in favorable outcome.

KEYWORDS: Cerebral hydatid cyst, CT, Echinococcosis

ÖZ

AMAÇ: Beyin bilgisayarlı tomografisinde serebral kist hidatiklerin görüntüleme bulgularının tanımlanması.

YÖNTEM ve GEREÇ: Serebral hemisferlerde hidatik kistleri olduğu patolojik olarak onaylanmış 5 hastanın BT görüntüleri retrospektif olarak incelendi. Hastalar iyotlu kontrast madde verilmesinden önce ve sonra ya bir spiral BT (single slice) ya da multidetector-row BT ile tarandı.

BULGULAR: Hastalar 8 ile 13 yaş arası 3 erkek ve 2 kız çocuğu idi. Bütün vakalarda başvuru esnasında kafaiçi basınç artış bulguları vardı. 5 vakanın hepsinde belirgin kitle etkisi yapan ve kalsifikasyon veya kontrast tutulumu göstermeyen büyük bir intraserebral kistik lezyona ait BT bulguları görüldü. 1 vakada perilezyonel ödem görüldü. Serebral kist hidatik ya homojen sıvı dolu tek lobüllü kist (3 vaka), ya birkaç tane çevresel yavru kisti olan tek lobüllü bir kist (1 vaka), ya da içinde birçok yavru kist olan bir kist (1 vaka) şeklinde görüldü. Bütün vakalar ameliyat edildi ve kist kranyotomiyle tamamen çıkartıldı.

SONUÇ: Serebral kist hidatiklerin ameliyat öncesi BT ile doğru teşhisi ve kist patlamasını engellemek için dikkatli cerrahi uygulanması iyi sonuçlar alınmasını sağlayacaktır.

ANAHTAR SÖZCÜKLER: Serebral kist hidatik, BT, Ekinokokus

INTRODUCTION

Hydatid disease in humans is a zoonotic infection caused by the larval stage of tapeworm of the genus Echinococcus (18). The disease is endemic in many sheep and cattle raising areas of the world like the Middle East, South America, New Zealand, Australia, parts of Europe, and India (13). However, because of modern day travel and population movement, it may be encountered in any part of the globe. Cystic echinococcosis caused by E. granulosus is much more common than alveolar echinococcosis caused by E. multilocularis (9). Adult form of the tapeworm E. granulosus lives in the intestine of definitive host like dog which excretes the ova in feces. Sheep are the intermediate host in the life cycle of this parasite. Humans are accidentally infected after intake of food and water contaminated by the eggs of parasite (18, 13). Larva hatches from the ingested ova in intestine and enters the portal circulation of man. Liver as the first filter is the most commonly involved organ in humans followed by the lungs. Once within the systemic circulation, larva may lodge and develop into hydatid cyst in other organs of the body like brain (9, 17). Hydatid cyst grows slowly in the brain and presents due to mass effect when quite large (4, 13). Cerebral hydatid cyst is

diagnosed on the basis of imaging with CT and MRI (4). We describe CT findings in primary cerebral hydatid cyst in 5 children.

MATERIAL and METHODS

We retrospectively reviewed CT scans of brain in 5 patients with pathologically confirmed cerebral hydatid cyst over a period of 3 years (2007-10). The study was approved by the institutional review board. Initially a non-contrast CT of brain was performed on acute neurological presentation to the emergency department which was followed by repeat CT after intravenous injection of iodinated contrast agent when a space occupying lesion was suspected in brain. Out of 5 patients with cerebral hydatid cysts, 2 were scanned on a spiral (single slice) CT; other 3 scans were performed on a 64-slice multidetector-row CT. CT brain was studied to determine the size, number, site and internal structure of the cyst as well as adjacent mass effect and edema produced by it. Ultrasonography of abdomen and X-ray chest were reviewed in all the cases. All the cases were operated emergently and Cystic Echinococcosis was confirmed on histopathology of the excised cyst.

RESULTS

All the cases with cerebral hydatid cyst were children aged 8-13 years with mean age of 10 years. There were 3 boys and 2 girls. Duration of illness ranged from 15 days to 3 months. Headache and vomiting at presentation were reported in all 5 cases. Visual disturbance, hemiparesis and seizures were seen in 2 patients each. Bilateral papilledema was present in all 5 cases. None of the cases had any cyst in liver or lungs. No cardiovascular abnormality was documented in any of the cases. A single cyst was seen in the supratentorial compartment of brain in all the cases; 3 cases had cyst in right and 2 in left cerebral hemisphere. 2 cases had cyst in temporoparietal and 2 had it in the parieto-occipital region of the brain; one cyst was in right temporal lobe. Cyst was spherical in 4 cases and oval in shape in 1 case. Cysts were entirely surrounded by brain parenchyma in all the cases (Figure 1). The smallest cyst was 6 cm in diameter and the largest one was 16 cm in largest dimension. Mass effect caused by the large size of cyst was present in all 5 cases in the form of compression of ipsilateral lateral ventricle and midline shift towards opposite side (Figure 1, 2). All the cases had a smooth and thin wall. No definite cyst wall calcification was seen in any of the cases. No contrast enhancement was present in any of the cysts. No perilesional edema was seen in 4 cases (Figure 1, 2). One large cyst with multiple daughter cysts inside was surrounded by white matter edema anteriorly due to superadded infection (Figure 3). Cyst showed homogenous fluid attenuation in 3 cases without any daughter cysts inside (Figure 1). Few peripheral daughter cysts were seen in 1 case (Figure 2). Multiple daughter cysts entirely filling the parent cyst were seen in 1 case (Figure 3). None of the cysts had collapsed membranes inside. Preoperative radiological diagnosis of cerebral hydatid cyst was suggested to the neurosurgeon in all 5 cases. Emergency surgery was performed in all cases due to neurological deterioration. After craniotomy entire cyst was removed in all 5 cases without allowing any accidental cyst rupture. None of the patients developed anaphylaxis. All the cases had optimal recovery and none developed recurrence.

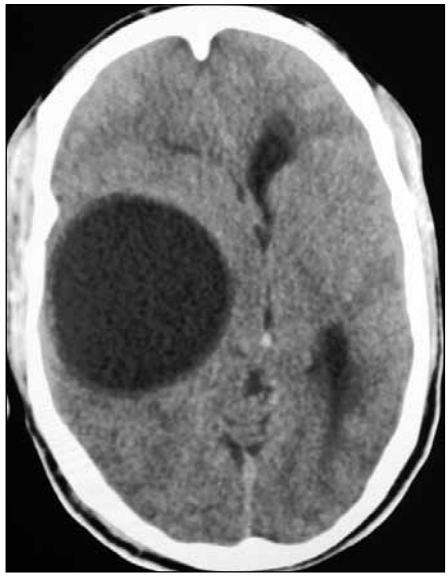

Figure 1: Contrast enhanced transverse CT image of brain showing a unilocular cyst, with homogenous fluid attenuation surrounded by thin imperceptible wall, in the right temporal lobe. No calcification, enhancement or perilesional edema is seen. Cyst is compressing right basal ganglia and thalamus; right lateral ventricle is effaced with midline shift towards left. Cyst is entirely surrounded by brain parenchyma.

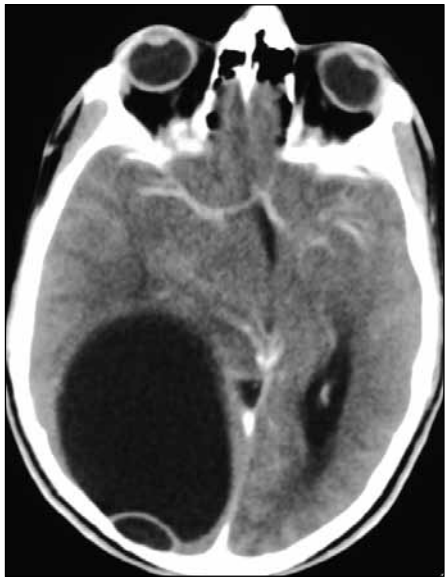

Figure 2: Contrast enhanced transverse CT image of brain shows an oval cyst in the right occipital lobe with a daughter cyst inside posteriorly adjacent to wall. Mass effect is present. No contrast enhancement or perilesional edema is seen.

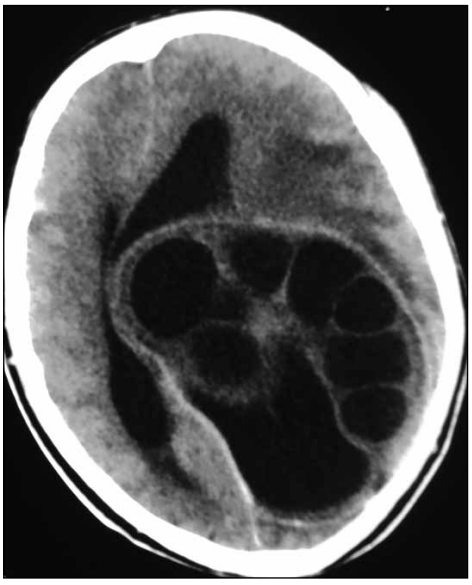

Figure 3: Contrast enhanced transverse CT image of brain showing a large oval shaped cyst lesion in the left parieto-occipital region entirely filled by multiple daughter cysts. Mild white matter edema is seen anterior to cyst. Significant mass effect is present with midline shift to right and compression of lateral ventricles with focal dilatation beyond obstruction.

DISCUSSION

Intracranial hydatid cysts are rare and these comprise 2% of space occupying lesions in brain. About 1-2% of patients with hydatid disease have intracranial hydatid cyst (13, 19). Majority (75%) of the patients are in the pediatric age group. An underlying patent ductus arteriosus in young children may predispose to systemic inoculation and intracranial localization of E. granulosus larva (13, 19). All the cases in our study were children 8-13 years old. However patent ductus arteriosus was not documented in any case.

Intracranial hydatid cysts are commonly seen in the supratentorial compartment located in cerebral hemispheres. Other reported sites include subarachnoid space, ventricles, pons, cerebellum, aqueduct of Sylvius, extradural space and diploic space of skull bones (6, 11, 12, 14, 21). Cerebral hydatid cysts are solitary. Multiple hydatid cysts in brain parenchyma are very rare and result from spontaneous, traumatic or post-surgical rupture of cyst in brain or elsewhere with embolisation of hydatids to brain; multiple cysts may arise in brain itself (28, 5). Cerebral hydatid cysts are classified as primary and secondary. Primary intracranial hydatid cyst results from direct infestation of brain by the larva without any demonstrable involvement of other organs like liver and lungs (1, 23). Primary cysts are fertile containing brood capsules and scolices and their rupture may result in recurrent intracranial hydatid cyst. Primary cysts are usually solitary. Primary multiple cerebral hydatid cysts, each containing pericyst with scolices and brood capsules inside, are quite unusual resulting from multiple larvae infecting brain after bypassing liver and lungs (5, 23). Secondary cysts are generally multiple and result from rupture of hydatid cyst in brain or in other organ of body (28). These cysts lack germinal membrane and are infertile with negligible risk of recurrence after their rupture (1). All the cases in our study were located in cerebral hemispheres and were solitary and primary there being no evidence of hydatid in liver or lungs.

Cerebral hydatid cysts are slowly growing. A growth rate of 1.5-10 cm/year has been reported (16). Patients present late when the cyst grows and becomes large in size to cause mass effect (4, 13). Headache and vomiting due to raised intracranial tension are the most common presenting features. Other manifestations of cerebral hydatid cysts are seizures, hemiparesis, visual disturbances and ataxia. Papilledema is usually present at the time of presentation in children with cerebral hydatid cysts. All the cases in our series had headache, vomiting and papilledema due to raised intracranial tension. Seizures and hemiparesis were other presenting features (9, 17, 18, 19).

Imaging with CT and MRI are central to the diagnosis of cerebral hydatid cysts. Both are equally good for detection and localization of the cyst in brain. Whereas CT is better in demonstrating cyst wall calcification, MRI has an advantage in delineating the relationship of the cyst with adjacent structures (4). Because of the acute and nonspecific neurological presentation, a patient with cerebral hydatid cyst is more likely to be imaged with CT than MRI due to the former being readily available in most of the emergency departments. Typical CT features of cerebral hydatid cyst include a spherical or oval homogenous fluid attenuation generally in the temporal and parietal lobes of cerebral hemispheres (8, 15). Cystic lesion is usually large with significant mass effect in the form of ventricular compression and midline shift. Calcification in the cyst wall is very rare, seen in around 1% of cases (20, 24). No enhancement or perilesional edema is seen in case of uncomplicated E. granulosus cysts (26, 29). Enhancement of the cyst and perilesional edema in a case of cystic echinococcosis of brain indicates complication like rupture, hemorrhage or infection in the cyst (10). Alveolar echinococcosis in comparison to cystic echinococcosis is seen as a solid or solid-cystic mass which commonly shows calcification and contrast enhancement with perilesional edema (27).

Recently an MR imaging classification has been proposed for cerebral cystic echinococcosis of brain on the lines of WHO classification of hepatic E granulosus cysts (1). This classification classifies the cysts on the basis of their fertility activity and imaging morphology. Type 1 cystic echinococcosis (CE1) which are fertile active cysts with protoscoleces appear as unilocular cysts without any visible wall or as unilocular spherical cysts with a clear visible wall. Type 2 cyst (CE2) which is also active is seen as unilocular mother cyst containing multiple vesicles arranged peripherally along the cyst wall. Type 3 (CE3) is a transitional form containing scolices that is seen as maternal cyst entirely filled by multiple daughter

cysts. CE 4 cysts show detached membranes as water-lily sign and CE 5 are calcified lesions. Both CE4 and CE5 are inactive cysts that have lost their fertility (1). Cerebral hydatid cysts on CT in our study showed varied morphology that corresponds to CE1, CE2 and CE3 types described with MRI. 3 cysts in our cases showed unilocular appearance that typifies CE1. One unilocular cyst had few peripheral daughter cysts along the wall corresponding to CE2. One case showed multiple daughter cysts entirely filling the maternal cyst as described in CE3. Perilesional edema was present in this case due to infection. Because of the small number of cases we did not observe the whole spectrum of cerebral cystic echinococcosis. However our observations suggest that morphological features of cerebral cystic echinococcosis can be equally well demonstrated by CT. Identification of these features enhances the diagnostic accuracy of CT in cerebral echinococcosis.

Cystic echinococcosis on CT needs to be differentiated from porencephalic cyst, arachnoid cyst, brain abscess and cystic neoplasm (4, 26). Porencephalic and arachnoid cysts are not spherical and are not surrounded entirely by brain parenchyma. Porencephalic cyst shows signs of volume loss and gliosis in adjacent white matter. Arachnoid cyst is extra-axial in location whereas intra-axial hydatid cyst is surrounded by brain parenchyma all around. Cystic tumor and brain abscess show definite contrast enhancement in the wall and or mural nodule; perilesional edema is also be present in case of abscess (4, 29).

The treatment of cerebral hydatid cyst is surgical and the aim of surgery is to excise the cyst completely without rupture to prevent anaphylactic reaction and local recurrence (7, 13). Preoperative diagnosis of cerebral hydatid cyst made on the basis of typical CT or MRI findings is an important component in the chain of events to prevent cyst rupture during surgery. Identification of relevant imaging findings should alert the operating neurosurgeon to exercise extreme care to prevent rupture of cyst (19, 21). The most commonly utilised surgical procedure designed to remove the intact cyst completely without rupture is by irrigating saline into the interface between cyst wall and brain. Few reports mention the efficacy of drug therapy with albendazole in the cure of cerebral hydatid cyst (7, 9, 13, 19, 21, 25). However drug therapy is better combined with surgery in case of accidental cyst rupture. We removed the cerebral hydatid cyst in toto without any rupture in all the cases. Our study reinforces the importance of preoperative diagnosis with CT in preventing rupture of cyst and thus achieving optimal outcome in case of cerebral hydatid cyst.

REFERENCES

1. Abdel Razek AA, El-Shamam O, Abdel Wahab N: Magnetic resonance appearance of cerebral cystic echinococcosis: World Health Organization (WHO) classification. Acta Radiol 50(5):549-554, 2009
2. Al Zain TJ, Al-Witry SH, Khalili HM, Aboud SH, Al Zain FT Jr: Multiple intracranial hydatidosis. Acta Neurochir (Wien) 144(11):1179-1185, 2002
3. Beskonakli E, Solaroglu I, Tun K, Albayrak L: Primary intracranial hydatid cyst in the interpeduncular cistern. Acta Neurochir (Wien) 147(7):781-783, 2005
4. Bukte Y, Kemaloglu S, Nazaroglu H, Ozkan U, Ceviz A, Simsek M: Cerebral hydatid disease: CT and MR imaging findings. Swiss Med Wkly 134(31-32):459-467, 2004
5. Cataltepe O, Tahta K, Colak A, Erbengi A: Primary multiple cerebral hydatid cysts. Neurosurg Rev 14(3):231-234, 1991
6. Cemil B, Tun K, Gurcay AG, Uygur A, Kaptanoglu E: Cranial epidural hydatid cysts: Clinical report and review of the literature. Acta Neurochir (Wien) 151(6):659-662, 2009
7. Ciurea AV, Fountas KN, Coman TC, Machinis TG, Kapsalaki EZ, Fezoulidis NI, Robinson JS: Long-term surgical outcome in patients with intracranial hydatid cyst. Acta Neurochir (Wien) 148(4):421-426, 2006
8. Demir K, Karsli AF, Kaya T, Devrimci E, Alkan K: Cerebral hydatid cysts: CT findings. Neuroradiology 33(1):22-24, 1991
9. Duishanbai S, Jiafu D, Guo H, Liu C, Liu B, Aishalong M, Mijiti M, Wen H: Intracranial hydatid cyst in children: Report of 30 cases. Childs Nerv Syst 26(6):821-827, 2010
10. El-Shamam O, Amer T, El-Atta MA: Magnetic resonance imaging of simple and infected hydatid cysts of the brain. Magn Reson Imaging 19(7):965-974, 2001
11. Furtado SV, Visvanathan K, Nandita G, Reddy K, Hegde AS: Multiple fourth ventricular hydatidosis. J Clin Neurosci 16(1):110-112, 2009
12. Gokalp HZ, Erdogan A: Hydatid cyst of the aqueduct of Sylvius: Case report. Clin Neurol Neurosurg 90:83–85, 1988
13. Gupta S, Desai K, Goel A: Intracranial hydatid cyst: A report of five cases and review of literature. Neurol India 47(3):214-217, 1999
14. Guzel A, Tatli M, Maciaczyk J, Altinors N: Primary cerebral intraventricular hydatid cyst: A case report and review of the literature. J Child Neurol 23(5):585-588, 2008
15. Karak PK, Mittal M, Bhatia S, Mukhopadhyay S, Berry M: Isolated cerebral hydatid cyst with pathognomonic CT sign. Neuroradiology 34(1):9-10, 1992
16. Kemaloglu S, Ozkan U, Bukte Y, Acar M, Ceviz A: Growth rate of cerebral hydatid cyst, with a review of the literature. Childs Nerv Syst 17(12):743-745, 2001
17. Kocaman S, Ersahin Y, Mutluer S: Cerebral hydatid cysts in children. J Neurosci Nurs 31(5):270-277, 1999
18. Krajewski R, Stelmasiak Z: Cerebral hydatid cysts in children. Childs Nerv Syst 7(3):154-155, 1991
19. Limaiem F, Bellil S, Bellil K, Chelly I, Mekni A, Khaldi M, Haouet S, Zitouna M, Kchir N: Primary hydatidosis of the central nervous system: a retrospective study of 39 Tunisian cases. Clin Neurol Neurosurg 112(1):23-28, 2010
20. McCorkell SJ, Lewall DB: Computed tomography of intracerebral echinococcal cysts in children. J Comput Assist Tomogr 9(3):514-518, 1985
21. Negovetic L, Lupret V, Smiljanic D, Arsenic B: Cranial vault and gigantic intracranial hydatid cyst in a young woman. Neurosurgery 27:480–482, 1990

22. Onal C, Unal F, Barlas O, Izgi N, Hepgul K, Turantan, Canbolat A, Turker K, Bayindir C, Gokay HK, Kaya U: Long-term follow-up and results of thirty pediatric intracranial hydatid cysts: Half a century of experience in the Department of Neurosurgery of the School of Medicine at the University of Istanbul (1952-2001). Pediatr Neurosurg 35(2):72-81, 2001
23. Popli MB, Khudale B: Primary multiple hydatid cysts of the brain. Australas Radiol 42(1):90-91, 1998
24. Rudwan MA, Khaffaji S: CT of cerebral hydatid disease. Neuroradiology 30(6):496-499, 1988
25. Todorov T, Vutova K, Petkov D, Balkanski G: Albendazole treatment of multiple cerebral hydatid cysts: Case report. Trans R Soc Trop Med Hyg 82(1):150-152, 1988
26. Topal U, Parlak M, Kilic E, Sivri Z, Sadikoglu MY, Tuncel E: CT and MRI findings in cerebral hydatid disease. Eur Radiol 5: 244–247, 1995
27. Tunaci M, Tunaci A, Engin G, Ozkorkmaz B, Ahishali B, Rozanes I: MRI of cerebral alveolar echinococcosis. Neuroradiology 41:844–846, 1999
28. Turgut M, Benli K, Eryilmaz M: Secondary multiple intracranial hydatid cysts caused by intracerebral embolism of cardiac echinococcosis: An exceptional case of hydatidosis. Case report. J Neurosurg 86(4):714-718, 1997
29. Tuzun M, Altinors N, Arda IS, Hekimoglu B: Cerebral hydatid disease CT and MR findings. Clin Imaging 26:353–357, 2002